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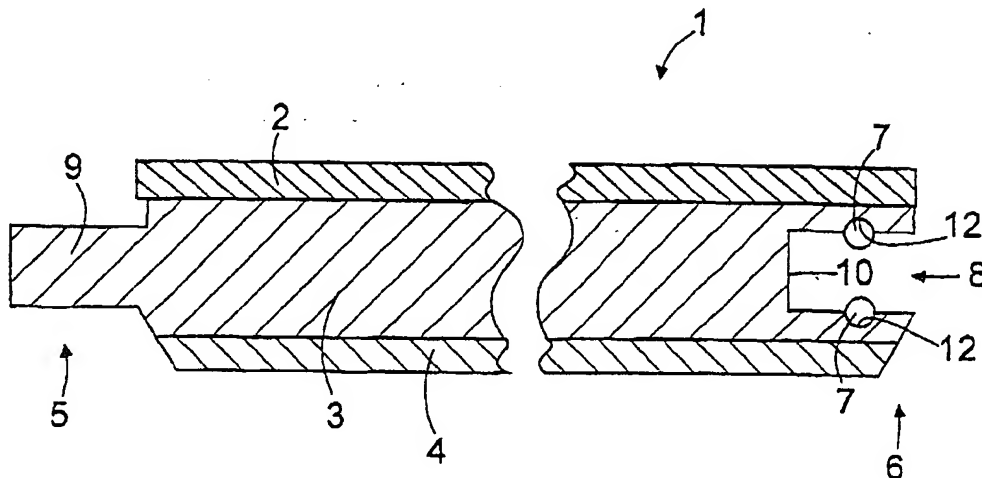
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(54) Title: BUILDING BOARD AND METHOD OF FASTENING ONE



(57) Abstract: A building board and its fastening method. The building board (1) comprises one or more structural layers made at least mainly of wood material and two parallel sides with a tongue (5) on the first side and a groove (6) on the second side. At least one closed package (7, 7') containing an adhesive agent is arranged to the tongue and groove (5, 6) in such a manner that when the tongue (5) and groove (6) of adjacent building boards (1) are joined, the adhesive agent bursts from the closed package (7, 7') and glues the tongue (5) and groove (6) together.

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BUILDING BOARD AND METHOD OF FASTENING ONE

FIELD OF THE INVENTION

[0001] The invention relates to a building board that comprises one or more structural layers made at least mainly of wood material, two parallel
5 sides with a tongue on the first side and a groove on the second side, the tongue and groove being shaped in such a manner that the building board can be joined with adjacent building boards.

[0002] The invention further relates to a fastening method for fastening together building boards having at least two parallel sides with a tongue
10 on the first side and a groove on the second side.

BACKGROUND OF THE INVENTION

[0003] In this application, a building board refers to a planar element, such as boarded parquet block, laminate element or the like, used in interior sheeting of buildings. Parquets are usually made of either solid wood or
15 laminated wood in such a manner, for instance, that in a boarded parquet block, there is hardwood on the wear surface on the side of the space to be sheeted and below it a softwood frame and possibly other functional layers. Below the hardwood, there may also be a planar frame made of MDF or HDF material or the like. In laminates, at least the wear surface is made of melamine resin, for instance, or some other polymer material, whereas the frame of
20 the laminate is manufactured of a board made mainly of wood material, such as MDF or HDF board, chipboard, OSB board or the like.

[0004] On at least one side of the building board, there is a groove and on the opposite side a tongue. The sheeting is formed by joining the
25 tongues and grooves of adjacent elements together to a tongue-and-groove joint. A floor covering made of building boards is typically a floating covering, in other words, the building elements are not fastened to the floor below, but other methods can naturally also be used. Building boards used in wall or ceiling sheeting are usually fastened to each other by tongue-and-groove joints
30 and to the structure below them.

[0005] So as to prevent building elements from moving relative to each other, the tongues and grooves must be locked together in some manner. Conventionally, glue is spread on either the tongue or the groove during the installation of the building boards, and after the glue is hardened, it locks the

elements together. Spreading glue requires time and work and thus slows down the sheeting work.

5 [0006] Glue-free tongue-and-groove joints or locking tongue-and-groove joints are also known, in which the tongue and groove are shaped in such a manner that when joined, they lock mechanically to each other and glue is not necessarily needed. This solution does not necessarily provide a completely fixed joint and the elements may move causing annoying creaking, for instance.

BRIEF DESCRIPTION OF THE INVENTION

10 [0007] It is an object of the present invention to provide a novel and improved building board and a fastening method of same, which avoid the above-mentioned problems.

15 [0008] The building board of the invention is characterized in that at least one closed package containing an adhesive agent is arranged to the tongue or groove in such a manner that, when joining the tongue and groove of adjacent building boards, the adhesive agent bursts from the closed package and glues the tongue and groove together.

[0009] Further, the fastening method of building boards of the invention is characterized in that

20 [0010] at least one closed package containing an adhesive agent is arranged to the tongue or groove on the first and/or second side,

[0011] adjacent building boards are fastened to each other on said parallel sides by joining the tongue and groove on the sides in question in such a manner that the adhesive agent bursts from the closed package on the surfaces to be joined together.

25 [0012] The essential idea of the invention is that at least one closed package containing an adhesive agent is arranged to the tongue or groove of a building board and that said adhesive agent bursts from said closed package when the tongues and grooves of the building boards are joined together.

30 [0013] The advantage of the invention is that it provides a very tight tongue-and-groove joint quickly and effortlessly.

BRIEF DESCRIPTION OF THE FIGURES

[0014] The invention will be described in more detail in the attached drawings, in which

Figure 1 is a schematic cross-sectional end view of a building board of the invention,

Figure 2 is a schematic cross-sectional view of a detail of a second building board of the invention,

5 Figure 3 is a schematic cross-sectional view of a detail of third building boards of the invention,

Figure 4 is a schematic cross-sectional view of a detail of fourth building boards of the invention,

10 Figures 5a to 5d are schematic views of a few closed packages of the invention, and

Figure 6 is a schematic cross-sectional view of a detail of a fifth building board of the invention.

15 [0015] For the sake of clarity, the invention is shown simplified in the figures. Similar parts are marked with the same reference numbers in the figures.

DETAILED DESCRIPTION OF THE INVENTION

[0016] Figure 1 is a schematic cross-sectional end view of a building board of the invention. The building board 1 is a boarded parquet block with a three-layer structure. Topmost, there is a wear surface 2 made of wood material that is installed towards the room, i.e. away from the subfloor. The wear surface 2 can be treated with varnish, oil or the like. The wear surface 2 of a boarded parquet block usually has one, two or three surface strips arranged side by side in the longitudinal direction of the boarded parquet block. Further, a boarded parquet block has an intermediate slat layer 3 and bottom slat layer 4 below the wear surface 2 that form a support layer of the boarded parquet block. The layers 2 to 4 are typically fastened to each other by gluing and they are all made of wood. The primary direction of the wood fibres of the intermediate slat layer 3 is generally substantially perpendicular to the wood fibres of the wear surface 2 and the bottom slat layer 4. This type of cross-laminated basic structure keeps the boarded parquet in shape even though wood always moves to some extent.

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[0017] The intermediate slat layer 3 can also be made of a board material manufactured mainly of wood, such as MDF, HDF or OSB material, chipboard or a corresponding material known per se. The bottom slat layer 4

can be made of wood veneer or paper, for instance. A boarded parquet block can also have other functional layers, such as soundproofing layers.

5 [0018] The structure of a boarded parquet block can naturally be of a different kind: it does not necessarily have to comprise three structural layers. A boarded parquet block may have only one support layer in addition to the wear surface. A solid-wood parquet block only has one layer that serves functionally both as the wear surface and the support layer. Naturally, there may also be more than three layers. In addition, the primary direction of the wood fibres of the wood on the wear surface 2 can be perpendicular to the surface of the boarded parquet block, etc.

10 [0019] Tongues and grooves are formed on the parallel sides of the boarded parquet blocks to join the blocks together. The first side has the tongue 5 and the second side has the groove 6. Said tongue 5 and groove 6 are naturally designed so that the tongue 5 of the boarded parquet block fits the groove 6 of the corresponding parquet block to be fastened to its side and that the groove 6 fits the tongue 5 to be fastened to its side. The ends of a boarded parquet block are often substantially shorter than the sides, but the ends may have similar tongues and grooves 5, 6 as the sides.

15 [0020] A boarded parquet block, as any building board of this application, can be equally long in each side, i.e. the side can be as long as the end.

20 [0021] The groove 6 of the boarded parquet block shown in Figure 1 has closed packages 7 on both sides of its channel 8. The packages 7 are fastened to the boarded parquet block at suitable intervals on substantially the entire length of the block. The closed package 7 is fastened by glue to a fastening recess 12 made in the block. The glue fastening the packages 7 is preferably a starch size, but it can also be glue based on some other binder, such as polyvinyl acetate, polyacrylate, epoxy, polyurethane or polychloroprene.

25 [0022] Inside the closed package 7, there is a cavity with adhesive agent. It should be noted that in this application, the concept 'adhesive agent' refers to a one-component adhesive or to one component of a two- or multi-component adhesive. In this case, it is a one-component adhesive.

30 [0023] When a projection 9 of the tongue of the adjacent boarded parquet block is fitted to the channel 8 of the groove, the package 7 is broken and the glue inside it spreads on the surfaces between the projection 9 and

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channel 8. When the glue hardens, it binds the joined boarded parquet blocks together.

[0024] There is no need to add glue to the tongue or groove during the installation of the block, the glue is already preinstalled in the groove 6.

5 This simplifies and fastens the installation work substantially, because the stage of spreading the glue is left out and there is no need to handle glue pots. In addition, the installation is very clean, because the installer does not need to handle glue at all.

10 [0025] The closed packages 7 can naturally be placed at some other point of the groove 6 of the building board than shown in Figure 1: for instance in one or more rows at the bottom 10 of the channel 8 or on only one side of the channel 8 or at a point where physical stress is directed to the packages 7 when the tongue 5 is fitted in place and makes the adhesive agent in the package 7 burst out of the package 7.

15 [0026] In the embodiment shown in Figure 1, the adhesive agent is a one-component adhesive. The glue is physically drying, in other words, the drying takes place when the solvent of the adhesive agent evaporates. The adhesive agent can also be glue that hardens due to a chemical reaction. The reaction can occur with moisture in the air, for instance. The glue is preferably
20 polyvinyl acetate, polyacrylate, polychloroprene or polyurethane, but it can also be starch or some other glue based on natural matter, such as casein.

[0027] Figure 2 is a schematic cross-sectional view of a detail of a second building board of the invention. The building board 1 is herein a laminate board that typically comprises a wear surface 2 made of melamine resin,
25 for instance, or some other polymer material known per se. The support layer of the laminate board usually comprises one frame layer 11 made of either MDF or HDF material. These materials are, as known, made of defibrated chip stock. Alternatively, the frame layer 11 is made of chipboard or OSB material.

[0028] The sides of the laminate boards have tongues and grooves
30 as described already in connection with Figure 1. To simplify the presentation, Figure 2 only shows a groove 6. At the bottom 10 of the channel 8 of the groove 6, there is a fastening recess 12, into which a closed package 7 containing adhesive agent is arranged. The structure of the package 7 is essentially rigid. The closed package 7 is somewhat compressed in the fastening
35 recess 12 and the resulting tension prevents the package 7 from detaching from the fastening recess 12. The closed package 7 is thus fastened by me-

chanical locking to the laminate board without any glue or other corresponding fastening agents. The closed package 7 can be arranged into the fastening recess 12 immediately after the groove 6 has been machined before the after-treatment of the building board or at some other later stage before the laminate board is installed in place. The fastening recess 12 can be a continuous channel over the length of the groove 6 or alternatively a substantially round dead hole or some other discontinuous recess in the longitudinal direction of the groove.

[0029] In another embodiment of the invention, the groove 6 does not have a separate fastening recess 12 and the closed package 7' is arranged in the channel 8 of the groove. This embodiment is shown in the Figure by a dashed line. The advantage of this embodiment is that the closed package 7' can be arranged in the groove of any building board known per se, as long as the package is designed in accordance with the groove. The fastening of the closed packages 7' does not require changes in the profile of the groove.

[0030] The tongue arranged to the groove 6 breaks the package 7 and the adhesive agent in the package spreads on the contact surfaces of the tongue and groove. The number of packages 7 is selected so as to achieve sufficient strength for the tongue-and-groove joint.

[0031] Figure 3 is a schematic cross-sectional view of a detail of third building boards of the invention. The closed package 7 is arranged to the tongue of the building board, of which the figure shows the tongue 5 of a first building board 1a. A groove 6 is correspondingly arranged on the other side of the building board, as shown in connection with a second building board 1b in the figure. The cross-sections of the building boards 1a and 1b are thus the same.

[0032] The tongue 5 comprises a locking recess 13 on the bottom surface of its projection 9, to which the closed package 7 is arranged. When placed in this manner, the closed package 7 is well protected from bumps or other corresponding accidental impacts that may break the closed package 7 and thus lead to the adhesive agent inside leaking out.

[0033] The groove 6 comprises a locking projection 14 that fits into the locking recess 13. When joined, the tongue and groove 5 and 6 form what is known as a locking tongue-and-groove joint, in which they are mechanically locked together in relation to the surface of the building boards 1a and 1b in

both the perpendicular direction T and in the direction P of the surface and the section plane of Figure 3.

5 [0034] A bursting point 15 is formed at the end of the locking projection 14. When the locking projection 14 is taken to the locking recess 13 and the building boards 1a, 1b are fastened to each other, the bursting point 15 breaks the package 7 letting the adhesive agent inside spread on the surfaces between the tongue and groove 5, 6.

10 [0035] The bursting point 15 is preferably equal in length with the tongue and groove 5, 6. Alternatively, the packages 7 can be arranged on the top surface or at the end of the projection 9. It should, however, be noted that the tongue-and-groove joint can also be implemented without the bursting point 15, and the bursting point 15 can naturally also be applied to other profiles than locking tongue-and-groove profiles and even when the closed package 7 is arranged to the groove 6. In the embodiment mentioned last, the
15 bursting point 15 is on the tongue 5.

[0036] The adhesive agent provides a very strong joint both in the above-mention directions T, P and in perpendicular direction to them. Table 1 shows some joint strength values achieved by the invention in comparison with known solutions. The measured values were obtained by a direct drawing test,
20 in which boarded parquet blocks forming a groove-and-tongue joint were pulled away from each other in the direction of their surface. The length of the parquet blocks was 15 cm. The column 'Package' shows the results of three drawing tests according to the solution of the invention and their average. The tongue-and-groove profile was as shown in Figure 2 without the fastening recess 12; the closed packages were placed in the channel 8 of the groove as
25 the packages 7' shown in Figure 2. In the tested embodiment, a 5-cm long, soft package made of polyethylene and seamed at the ends was arranged in the middle of the groove. This type of package is shown in Figure 5d. The column 'No glue' shows the measuring results from the drawing test of a glue-free joint. The columns 'Glue 1' and 'Glue 2' show the measuring results of boarded
30 parquet blocks glued along the entire length of the tongue-and-groove joint in a conventional manner and with two different glues. Two drawing tests were made with both the glue-free joint and the conventional glue joints and the average was calculated for them. The unit in the table is Newton [N].

[0037] Table 1

[N]	No glue	Package	Glue 1	Glue 2
1	73	1426	3000	2533
2	47	1850	2166	2415
3	----	1638	----	----
Average	60	1638	2583	2474

[0038] The strength of the joint implemented by boarded parquet blocks of the invention was approximately 30fold in comparison with a glue-free joint and approximately two-thirds in comparison with joints glued in the conventional manner. With the closed packages, the strength of the tongue-and-groove joint was raised to a sufficient level, the conventional, glued tongue-and-groove joint is unnecessarily strong for most applications. Changing the number of packages per the unit of length of the tongue or groove makes it possible to adjust the strength of the tongue-and-groove joint. If necessary, it is possible to achieve with the packages the strength of a tongue-and-groove joint glued in the conventional manner.

[0039] Figure 4 is a schematic cross-sectional end view of a detail of fourth building boards of the invention. Now, a closed package containing adhesive agent is arranged to both the tongue 5 and the groove 6, namely a first closed package 7a is fastened to the end of the projection 9 of the tongue and a second closed package 7b is fastened to the bottom 10 of the groove. The glue used in the embodiment shown in Figure 4 is a two-component adhesive with the first component arranged in the first closed package 7a and the second component in the second closed package 7b. When pressing the tongue and groove 5, 6 together to form the joint, the packages 7a and 7b are broken and the adhesive agents inside them burst between the tongue and groove 5, 6 mixing together and forming the glue that fastens the tongue and groove together. The two-component adhesive can be polyurethane glue or epoxy glue, for instance. Two-component adhesive can also be applied in such a manner that the closed packages 7a, 7b containing the different components are all fastened to either the tongue 5 or groove 6 and so close together that the components definitely mix together when the tongue and groove are joined.

[0040] Figures 5a to 5d are schematic views of a few capsules of the invention. Figure 5a shows a closed package 7 in the shape of a round

cylinder with a length of approximately 1 cm and a diameter of approximately 0.5 cm, but the measurements can vary from this. The closed package 7 can be of another shape, such as another kind of cylinder, ball or the like. The shown closed package 7 in the shape of a round cylinder can be made by equipment and methods known per se.

[0041] Figure 5b shows a cross-section of a closed package 7 in the shape of a round cylinder. The closed package 7 has a closed shell 16 made of polymer material, such as polyolefin, polyethylene terephthalate, polyvinylchloride, or metal, such as aluminium, or a combination thereof. The shell 16 of the package is in one piece, but it can naturally also be made of two or more pieces or layers. In addition, the shell 16 of the package is self-supporting so that its shape is essentially the same whether it is filled with adhesive agent or not.

[0042] Inside the shell 16, there are two cavities, namely a first cavity 17a and a second cavity 17b. The cavities 17a, 17b are separated from each other by an intermediate wall 18 that is preferably made of the same material as the shell 16. The first cavity 17a is filled with the first component 19a of the two-component adhesive and correspondingly, the second cavity 17b is filled with the second component 19b of the two-component adhesive. When the closed package 7 is broken, the adhesive components 19a, 19b mix together between the tongue and groove and the glue starts to harden and the building boards start to glue together.

[0043] The intermediate wall 18 can also be positioned in another manner: for instance it may divide the package longitudinally or the package 7 may have a two-shell structure so that the second cavity 17b is substantially entirely surrounded by the first cavity 17a.

[0044] The closed package 7 shown in Figure 5c is band-like: It may substantially be equal in length to the length of the entire tongue or groove or the tongue or groove may have several consecutive band-like capsules 7. The closed package 7 contains a two-component adhesive so that the cavities 17a and 17b containing the different adhesive components alternate in the longitudinal direction of the package.

[0045] It is naturally also possible to use a one-component adhesive in the closed package 7 shown in Figure 5c, in which case all the different chambers 17 naturally contain the same adhesive agent.

[0046] The shell 16 of the closed package shown in Figure 5d is soft, in other words, the package is easy to shape and the pressure of the adhesive agent inside the shell 16 affects the shape of the shell 16. The shell 16 is made of tubular polyolefin film, for instance. The adhesive agent is arranged inside the film, after which it is seamed at the ends with seams 21 so as to form a closed package 7. A corresponding package 7 can naturally also be made of planar film or films, in which case, in addition to the ends, there is a seam on at least one side of the shell 16.

[0047] Figure 6 is a schematic cross-sectional view of a detail of a fifth building board of the invention. A part of Figure 6 is shown enlarged on the right side of the building board 1. The closed packages 7 are microcapsules, i.e. their size is approximately 1 mm or less. The closed packages 7 are arranged to the groove 6 of the building board 1 by mixing them first with a carrier 20. The carrier 20 can be starch or some other glue based on natural binders or synthetic binder, such as polyvinyl acetate or polyacrylate.

[0048] The mixture of the carrier 20 and closed packages 7 is a fluid material that can be processed in liquiform, for instance a gel, foam or liquid. The mixture of the carrier 20 and closed package 7 can be brushed, sprayed or extruded to the groove 6, after which the carrier 20 is allowed to dry.

[0049] The carrier 20 and the closed packages 7 can also be arranged to the groove separately, for instance by arranging first the carrier 20 and then the packages 7 to the groove. Microcapsules can also be coated with a thin carrier layer, after which they are for instance blown or brushed to the groove.

[0050] The adhesive agent inside the closed package 7 can be a one-component adhesive or one component of a two- or multi-component adhesive. The adhesive agent can for instance be any adhesive agent mentioned earlier in this application. If the glue is a two- or multi-component adhesive, the groove 6 preferably has enough different capsules 7 for each component. When the tongue is pushed into the groove 6, the adhesive agent in the microcapsules discharges from the capsules 7 and the tongue and groove are glued together. The embodiment provides the advantage that the microcapsules can be easily and simply handled in mass production. The microcapsules can also be arranged in the tongue or both the tongue and groove.

[0051] The drawings and the related specification are only intended to illustrate the idea of the invention. The invention may vary in detail within the

scope of the claims. Thus, it is noted that the tongue and groove profiles shown in the figures are only examples: the closed package 7 can be arranged to any tongue-and-groove or locking tongue-and-groove profile known per se. The tongue and groove 5, 6 can be made in manners known per se, such as

5 by milling, sawing or pressing. The closed package 7 can be fastened mechanically to a boarded parquet block or by gluing to a laminate board. The closed package 7 can also be used in the tongue or groove of a solid-wood board. The mainly wooden layer can also be made of paper or board.

CLAIMS

1. A building board that comprises one or more structural layers made at least mainly of wood material, two parallel sides with a tongue (5) on the first side and a groove (6) on the second side, the tongue and groove being shaped in such a manner that the building board (1) is joinable with adjacent building boards (1), **characterized** in that at least one closed package (7, 7') containing an adhesive agent is arranged to the tongue or groove (5, 6) so that when the tongue (5) and groove (6) of adjacent building boards (1) are joined together, the adhesive agent bursts from the closed package (7) and glues the tongue (5) and groove (6) to each other.
2. A building board as claimed in claim 1, **characterized** in that it comprises two parallel ends with the tongue (5) in the first end and the groove (6) in the second end, the tongue and groove (5, 6) being shaped in such a manner that the building board (1) is joinable at its ends with adjacent building boards (1).
3. A building board as claimed in claim 1 or 2, **characterized** in that its ends and sides are of substantially different length.
4. A building board as claimed in claim 1 or 2, **characterized** in that its ends and sides are of substantially equal length.
5. A building board as claimed in any one of the preceding claims, **characterized** in that it is a boarded parquet block.
6. A building board as claimed in any one of claims 1 to 4, **characterized** in that it is a laminate board.
7. A building board as claimed in any one of claims 1 to 4, **characterized** in that it is a solid-wood block.
8. A building board as claimed in any one of the preceding claims, **characterized** in that the closed package (7, 7') is arranged to the tongue (5).
9. A building board as claimed in any one of the preceding claims, **characterized** in that the closed package (7, 7') is arranged to the groove (6).
10. A building board as claimed in any one of the preceding claims, **characterized** in that the adhesive agent is a one-component adhesive.

11. A building board as claimed in any one of claims 1 to 9, **characterized** in that the adhesive agent is a component of a two-component adhesive that forms the glue with the second component.

5 12. A building board as claimed in claim 11, **characterized** in that the different components of the glue are arranged in separate cavities (17a, 17b) in the same closed package (7, 7').

10 13. A building board as claimed in claim 11, **characterized** in that the different components of the glue are arranged each in a separate closed package (7, 7') and that closed packages (7, 7') containing all of the different components of the glue are arranged to the tongue and groove (5, 6).

14. A building board as claimed in claim 13, **characterized** in that the closed packages (7, 7') containing the first glue component are arranged to the tongue (5) and the closed packages (7, 7') containing the second glue component are arranged to the groove (6).

15 15. A building board as claimed in any one of the preceding claims, **characterized** in that the closed package (7, 7') is fastened by gluing to the tongue or groove (5, 6).

20 16. A building board as claimed in any one of claims 1 to 14, **characterized** in that the closed package (7, 7') is fastened mechanically to the tongue or groove (5, 6).

17. A building board as claimed in any one of the preceding claims, **characterized** in that the closed package (7, 7') is a microcapsule.

25 18. A building board as claimed in claim 17, **characterized** in that the microcapsule is arranged to the tongue or groove (5, 6) by means of a carrier (20).

19. A fastening method for fastening together building boards (1) having at least two parallel sides with a tongue (5) on the first side and a groove (6) on the second side, **characterized** in that

30 at least one closed package (7, 7') containing an adhesive agent is arranged to the tongue or groove (5, 6) on the first and/or second side,

adjacent building boards (1) are fastened together on said parallel sides by joining the tongue (5) and groove (6) on the sides together in such a manner that the adhesive agent in the closed package (7, 7') bursts on the surfaces to be joined.

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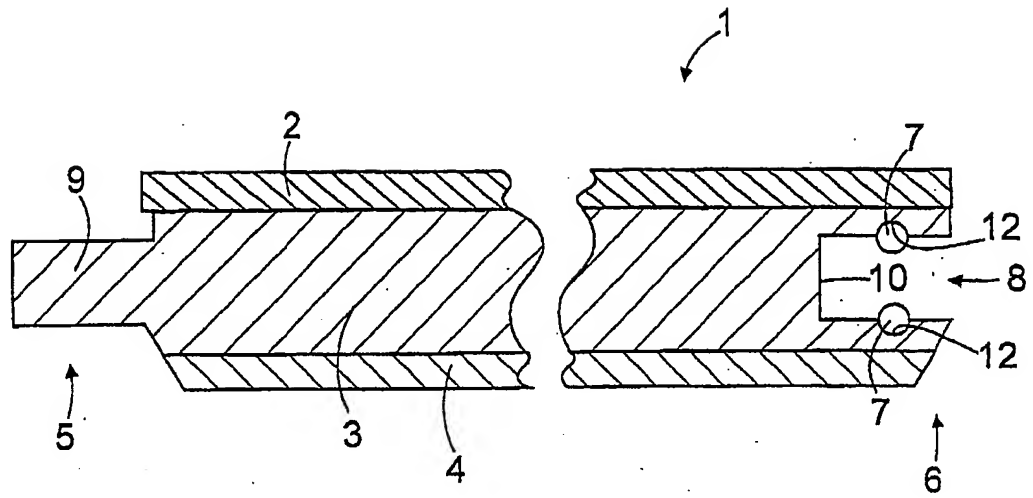


Fig. 1

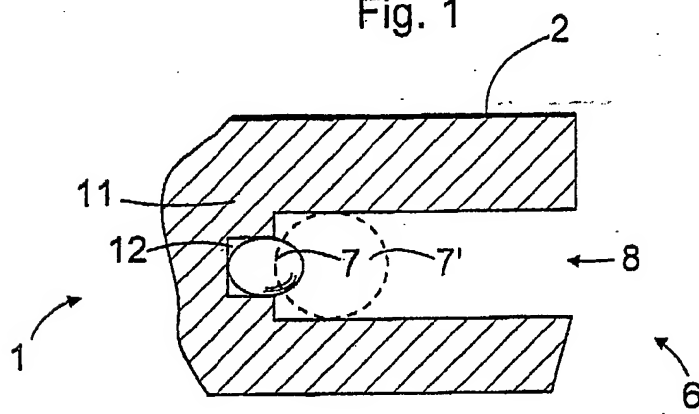


Fig. 2

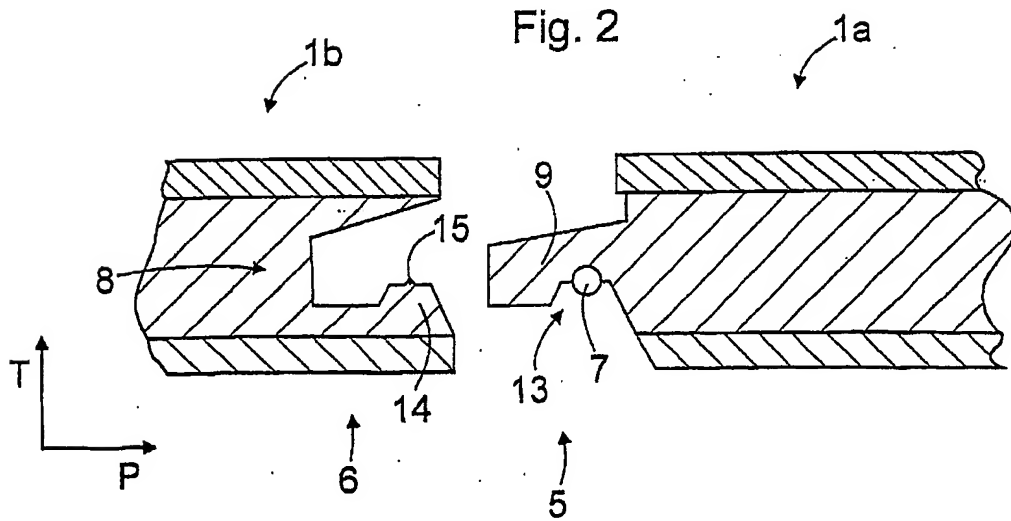


Fig. 3

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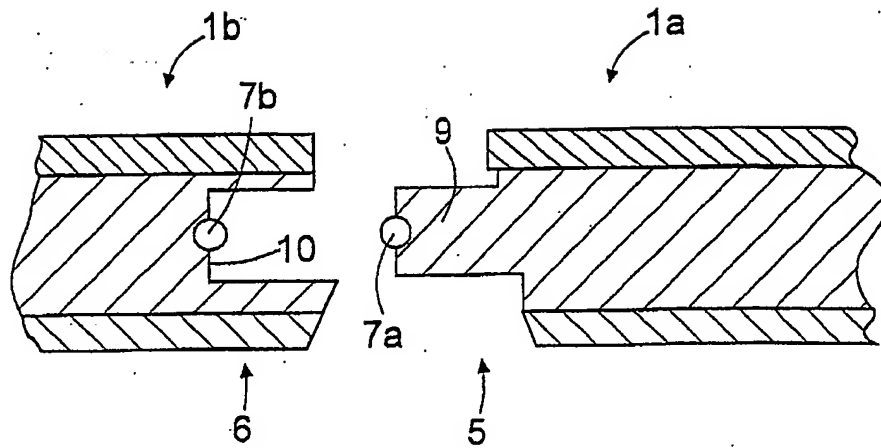


Fig. 4

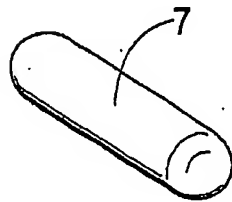


Fig. 5a

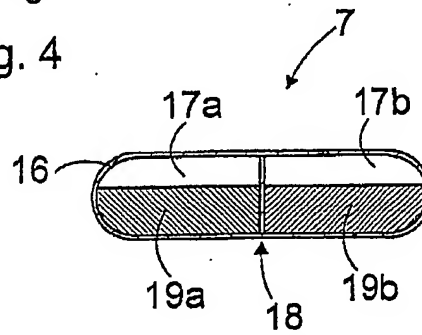


Fig. 5b

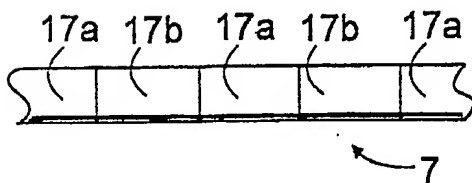


Fig. 5c

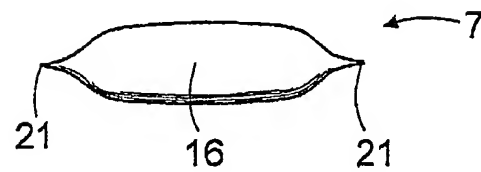


Fig. 5d

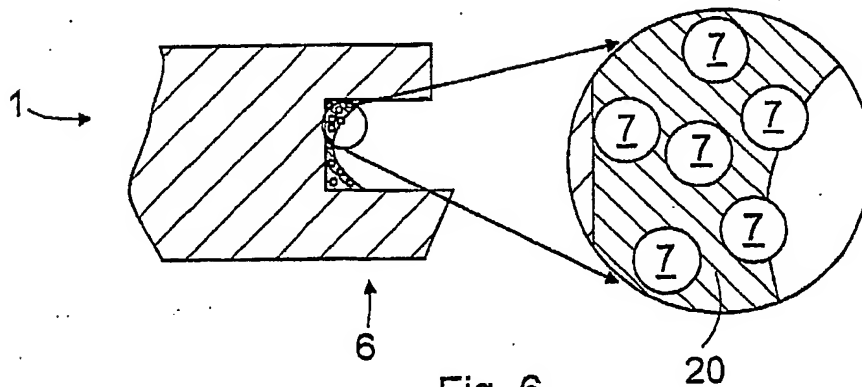


Fig. 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 03/00336

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: F16B 5/00, F16B 11/00, F16B 12/04, E04B 1/61

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: F16B, E04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 19821938 A1 (BASF AG), 18 November 1999 (18.11.99), column 2, line 11 - line 22	1-11,14-16, 19
Y	--	12,13,17,18
X,P	DE 10131248 A1 (KRONOTEC AG), 23 January 2003 (23.01.03), column 2, line 53 - line 68; column 3, line 1 - line 6	1-11,14-16, 19
Y	--	12,13,17,18
A	EP 0733756 A2 (WILSONART INTERNATIONAL INC.), 25 Sept 1996 (25.09.96), figures 2-4	1-19
	--	

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Date of the actual completion of the international search

11 July 2003

Date of mailing of the international search report

15 JUL 2003

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 03/00336

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4019630 A (PLAISTED), 26 April 1977 (26.04.77), column 2, line 26 - line 36, figure 1 --	12,13
Y	US 4100954 A (MÜLLER ET AL), 18 July 1978 (18.07.78), column 6, line 11 - line 29, figure 2A --	17,18
A	DE 3425724 A1 (SIEMENS AG), 23 January 1986 (23.01.86), page 2, line 7 - line 10 -- -----	1-19